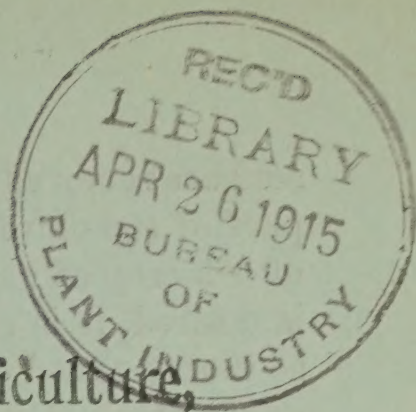


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# United States Department of Agriculture,

## BUREAU OF PLANT INDUSTRY,

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### RED CLOVER (*Trifolium pratense*).

Red clover is the most important of all leguminous forage crops, on account of its high value as feed, its effect upon the soil, and the ease with which it may be employed in rotations. Under ordinary conditions red clover is a biennial, although in pastures where it is kept from seeding single plants have been known to live for a considerably longer time than two years. Frequently stands may be kept up by allowing the clover to reseed itself, although it is a question whether this is a paying proposition upon the more expensive agricultural lands.

Red clover is considered a commercial crop throughout the north-eastern quarter of the United States, as far west as central Kansas, in the Rocky Mountain region, and in the Pacific Northwest.

Red clover is an excellent crop for pasture, hay, soiling, and renovating the soil. In rotations in the greater part of the clover belt it can be made to precede or follow almost any field crop, and in the southern part of the clover area, especially south of the Ohio River, it is a promising crop when sown in corn at the last cultivation.

#### RED CLOVER AS A PASTURE CROP.

Red clover makes an excellent pasture for all kinds of live stock. Care must be exercised not to turn sheep or cattle in a clover pasture when they are hungry or when the clover is wet with dew or rain, since bloating may occur. This is especially true in turning cattle and sheep on clover in the early spring. As ordinarily grown in rotations, red clover furnishes some pasture in the fall of the year it is planted, but it should not be grazed too closely, since winterkilling is likely to occur. It is best to let the clover go into winter quarters with a growth of at least 4 inches to act as a cover crop. Where two crops of hay are harvested the same season there will be a little pasture after the second hay crop, but where a crop of hay and a crop of



seed are removed, little pasture will result. Throughout the northern part of the clover area, where the season is not long enough to produce a crop of hay and a crop of seed the same year and the seed crop is desired, it is customary to pasture the clover until about June 1, so that the seed crop may be harvested later in the season. As soon as the stock is removed it is recommended that the field be clipped, setting the machine to cut as high as possible, so that an even stand for the seed crop will be secured.

#### **RED CLOVER AS A HAY CROP.**

Red clover produces very satisfactory yields of hay throughout the clover area. Either two crops of hay or one crop of hay and one of seed may be produced the same season except in the northern part of the clover belt, where the season is not long enough to produce both a crop of hay and a crop of seed. This is especially true with mammoth clover, since it comes into bloom about two weeks later than medium red clover. In such sections the first growth may be clipped back about the middle of June. Ordinarily red clover yields from 1 to 2 tons of hay per acre. This hay is a very nutritious feed, being rich in protein, and for this reason makes an excellent forage for growing stock and milch cows.

#### **RED CLOVER AS A SOILING CROP.**

Red clover makes excellent green feed for milch cows. The average yields of green matter of red clover vary from 6 to 12 tons per acre. The season for soiling may commence about 10 days before the plants come in bloom and may continue as long as the plants remain green.

Bloating does not occur when clover is fed in this manner, but it must not be wet with dew or rain when cut, nor should it be wilted.

#### **RED CLOVER AS A SOIL IMPROVER.**

The clovers have been justly ranked as the principal foundation of a permanent system of agriculture in the northern and eastern parts of the United States. With the proper utilization of clover in rotations it is possible to maintain the supply of nitrogen and humus in the soil. Experiments show that 30 to 50 per cent of the fertilizer value of clover may lie in the roots and stubble which are plowed under, even though the hay crop is removed, and this, together with the large quantity of vegetable matter which is added to the soil, rapidly increases its productive powers. It frequently happens that yields of grain crops are increased as much as 10 bushels to the acre by turning under clover sod.

Red clover is recommended and used quite extensively as a green-manure crop. When used in this manner the first crop is ordinarily



cut for hay and the second crop plowed under. This adds a considerable quantity of vegetable matter to the soil and is to be recommended when soils are low in humus content. However, the field should be planted to grain the same fall the clover is plowed under, so as to retard the leaching of the fertilizer elements of the soil. Where the soil is not entirely depleted in organic matter it is a better plan to cut the clover for hay, feed it to stock, and haul the manure back to the land. If the second crop is cut for seed, the straw may be scattered over the land or used for bedding. It has little feeding value. Where conditions are such that the manure can be handled properly, only a small quantity of fertilizer is lost. At the same time benefit is derived from feeding the hay. It is estimated that a ton of clover hay contains nearly \$10 worth of fertilizing elements.

Red clover also makes a very good winter cover crop, in that it prevents the soil from washing and gullying and the leaching of fertilizer elements from the soil during the winter. A considerable quantity of the fertilizer elements which would leach from the soil if no crop was present is taken up by the clover roots and returned to the soil when the plants are plowed under.

#### RED CLOVER IN ROTATIONS.

One of the most common rotations in the clover belt is corn, oats, wheat, and clover. In this rotation the clover is sown in the spring on winter wheat. Timothy is also added to this rotation in many places and is sown in the fall with the wheat, so that the year following the wheat a crop of mixed clover and timothy hay is harvested, while the following year the crop is principally timothy. This ground is then broken up and put into corn. In this rotation rye may be substituted for wheat.

In sections north of the winter-wheat belt it is the usual practice to sow clover with spring-sown grain. In this case it is impossible to rely upon frost to cover the clover seed, as the ground must be comparatively warm before being worked for the reception of the grain crop, so that it is necessary either to harrow in the seed or plant it with a disk drill. Of the spring-seeded cereals oats are used more than any other species, and yet oats are probably the worst of any of the cereals from the standpoint of smothering out the young clover plants.

#### VARIETIES OF RED CLOVER.

There are two varieties of red clover on the market, ordinary or medium red and mammoth red clover. The latter is sometimes known as sapling, giant, pea-vine, or soiling clover. Mammoth clover is larger and coarser and matures from two to three weeks later than the ordinary clover. For this reason it is often preferred for



seeding with timothy. It matures but one crop a year. In appearance the seeds of these two varieties are practically identical.

#### SOIL REQUIREMENTS OF RED CLOVER.

While red clover will grow successfully on a variety of soils, it is best adapted to deep, well-drained clay loams and calcareous loams. However, it is necessary that soils of this type be well drained; otherwise the clover may either winterkill or heave out. Sandy soils well supplied with humus also produce good crops of red clover. Unlike alsike clover it will not grow on soggy or wet peaty soils.

It is very essential that soils for red clover be well limed, since red clover will not usually make a satisfactory growth on acid soils. Since most of the soils throughout the clover-growing region are becoming acid, it is recommended that upon soils where clover does not do well a liberal application of lime be made. For this purpose a ton of caustic lime or 2 tons of finely ground limestone will usually be sufficient.

It is also necessary in order to obtain a good stand of clover to have soil fairly rich in humus.

#### PREPARATION OF THE SEED BED.

Whether the clover be seeded alone or with a nurse crop, it is necessary to have the seed bed fine and reasonably well settled, in order to insure prompt germination and the proper establishment of the young plants. When seeded with a grain crop no special preparation is usually necessary.

Under ordinary conditions red clover is able to succeed by utilizing the residues of whatever fertilizers have been used for the previous crops. However, on soils which are somewhat low in fertility, returns are made much more certain by top-dressing with manure previous to the time of seeding. Manure may often be advantageously applied to the preceding crop, especially if it is an intertilled crop, since the cultivation of it will kill the weeds.

#### SEEDING RED CLOVER.

Red clover is usually sown in the spring, except in southern localities and in western Oregon and Washington, where it is sown in the autumn. It is usually seeded at the rate of 8 to 12 pounds of seed per acre. When seeded in a mixture with timothy or other grasses 6 to 8 pounds per acre are sufficient. Red clover often fails to catch if not planted sufficiently deep to insure proper moisture for the young plants. When sown in light soils it should be planted about 1 inch deep, while in clay soils one-half inch is usually sufficient. On reasonably loose land, especially sandy soil, rolling the



ground is recommended after seeding. If a smooth roller is used, it should be followed by a light harrow or brush. It is the common practice to sow timothy with wheat in the autumn and the clover on the wheat in the early spring when the ground is honeycombed or checked by frost. This will give the seed a light covering and usually insure germination.

Where clover is seeded with spring grains it is the practice in some localities to attach a grass seeder to the grain drill and drop the clover seed either in front or behind the grain hose. In case the seed is dropped in front of the hose it will be sufficiently covered by the drill, but if dropped behind the hose it will be necessary to cover the seed with a harrow. Clover is also seeded with various types of rotary seeders and harrowed in. When a nurse crop is used with red clover it should be seeded at about two-thirds the usual rate. This is necessary, as the nurse crop is apt to use most of the available moisture at the expense of the clover. In case a nurse crop is used with clover and a drought comes on during the early summer, it is recommended that the nurse crop be cut for hay, since this will give the clover a greater chance to mature.

#### INOCULATION OF RED CLOVER.

Ordinarily inoculation for red clover is not necessary, especially in the States in the clover belt. This is due to the fact that it has been grown so extensively in these regions that natural agencies have provided inoculation. However, in planting red clover on ground where it has not been recently seeded to this crop, it is recommended that inoculation of some sort be provided.

#### HARVESTING RED CLOVER.

Red clover should be cut for hay as a general rule when just past full bloom. At this stage the maximum of protein and dry matter is present. The leaves are still intact and the stems green. It frequently happens, however, that in order to avoid insect enemies in the seed crop it is necessary to cut the first crop when in very early bloom, although the plants are somewhat sappy and more difficult to cure into a good quality of hay.

The methods of harvesting red-clover hay vary considerably. In general, it is desired to so handle the hay that it will reach the barn or stack with the least possible exposure to the weather and a minimum loss of leaves. Clover should not be allowed to become too dry in the swath or windrow, else the leaves will crumble and result in dusty hay. The hay should be shocked before the leaves become entirely dry. Brown clover hay is made by stacking the hay when it has just reached the wilting stage. This hay must be free from external moisture if overheating is to be avoided.



**SEED PRODUCTION OF RED CLOVER.**

The largest yields of seed are secured from a medium thin stand. Throughout the greater part of the clover belt it is the practice to cut the second crop for seed. The first crop seeds less abundantly than the second. Sometimes large yields of seed are obtained by pasturing until the first of June and then allowing the plants to seed. This is particularly true of mammoth clover. The time of cutting the first crop bears an important relation to the seed production. For the largest possible yield of seed the first growth should be cut not later than when it is coming into bloom. In comparatively dry seasons seed crops are ordinarily much larger than during seasons of considerable rainfall.

The crop for seed should be cut when nearly all of the heads have turned brown or black. The cutting may be done with a mowing machine as ordinarily used for mowing hay or with a platform attachment on the cutter bar. The self-rake reaper is also used, as well as the ordinary grain binder. When the binder is used, however, the hay is not tied in bundles. When the mower is used, the hay should be raked while damp and bunched to prevent shattering. After the crop is bunched in the field it should be allowed to become thoroughly cured in the bunch or cock before thrashing. The thrashing is usually done with a special clover huller. Common grain thrashers with hulling attachments also give good results.

**CLOVER FAILURES.**

During the past 10 years the acreage in successful stands of unmixed red clover has materially decreased. Observations indicate that this failure to produce successful stands of clover is not due to any one particular cause, but rather to a number of different causes, any one or any combination of which may react very unfavorably on the stand of clover. In some sections failure is due to poor drainage or to an insufficient quantity of fertilizing elements in the soil. Probably the primary causes of clover failure are due to depletion of the humus content of the soil and to soil acidity. This depletion of humus makes the soil nonretentive of moisture in time of drought, reducing the vitality of the clover plants and rendering them more liable to attacks of disease or to winterkilling. In severe drought or unfavorable winter weather this is apt to prove more disastrous to the stand than if the plants were in the vigorous condition rendered possible by a soil well filled with humus. It is for this reason that seedlings in the spring with a nurse crop have so often failed within recent years. Lack of lime in the soil is also a frequent cause of clover failure, especially when there is any lack of humus. Plant diseases and toxins or poisonous substances given



off by the clover roots may also enter into the problem of clover failures.

#### RED CLOVER IN MIXTURES.

For ordinary farm purposes it is very often advantageous to seed red clover in a mixture with other clovers and tame grasses. As the root systems of the different species are not the same, both the upper and lower layers of soil are more fully occupied when a mixture is seeded than when a single crop is sown alone. Another advantage is that in case the stand is to be used for pasture, better pasture for a longer period of time will be obtained from a proper mixture than from a single crop. Red clover is most commonly seeded with timothy throughout the clover belt. The timothy is seeded in the fall with wheat and the clover in the spring on the honeycombed ground. In this mixture 9 pounds of timothy and 6 pounds of red clover to the acre are ordinarily used. Along the southern border of the clover belt, orchard grass and red clover are commonly sown together. In this mixture 10 pounds of orchard-grass seed and 8 to 10 pounds of clover seed to the acre are used. To this mixture may also be added 15 to 20 pounds of tall meadow oat-grass seed and 1 to 2 pounds of alsike clover. In low places, which may exist in a meadow, it is recommended that these be seeded to redtop and alsike clover, since they will endure wet conditions much better than red clover. Where timothy and red clover are seeded together and the ground is to be used for pasture for several years, it is a good plan to replace part of the red-clover seed with alsike-clover seed, as the alsike clover is a perennial plant and will live longer than the red clover.

J. M. WESTGATE, *Agronomist.*

H. S. COE, *Scientific Assistant,*  
*Clover Investigations.*

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